

Morphology Control of Metal Oxide Particles for Multifunctional Cosmetic Application

Tsugio Sato^{a*}, Mizuki Yoshida^a, Shu Yin^a, Takehiro Goto^b, Takumi Tanaka^b

¹*Institute of Multidisciplinary Research for Advanced Materials, Tohoku University,
Sendai 980-8577, Japan*

²*Daito Kase Kogyo Co. LTD., Osaka 535-0005, Japan*

**tsusato@tagen.tohoku.ac.jp*

Keywords: *Solvothermal reaction, Oxide particles, Morphology control, Multifunctional cosmetics.*

Metal oxides have been used as various functional materials, such as electronics, pigments, UV-shielding materials, etc. The morphology controlled particles of CeO₂, ZnO, K_{0.80}(Li_{0.27}Ti_{1.73})O₄ and Al₂O₃ were fabricated by solvothermal reactions in order to realize multifunction, such as UV-shielding, comfort, glossing, soft-focusing, etc. for cosmetic application.

The nanoparticles of Ca²⁺ doped CeO₂ were prepared by the coprecipitation reaction of Ce³⁺ and Ca²⁺ at room temperature followed by the oxidation with H₂O₂. Plate-like microparticles of CeO₂ were prepared by the reaction of Ce(NO₃)₃ and NaHCO₃ at room temperature followed by calcination in air. The plate-like microparticles of K_{0.80}(Li_{0.27}Ti_{1.73})O₄ were fabricated by flux method using a KCl flux. The plate-like microparticles of Al₂O₃ were prepared by the reaction of Al(NO₃)₃ and NaHCO₃ aqueous solutions around 240°C. The morphology controlled ZnO, such as plate-like, rod-like, star-like and spherical ones were formed by solvothermal reactions using Zn(NO₃)₂ and various alkalis and surface modifiers, such as hexamethylenetetramine, monoethanolamine, triethanolamine, ethylene glycol, Fe³⁺, etc. around 80°C.

The nanoparticles of Ca²⁺ doped CeO₂ showed excellent UV-shielding ability with the low oxidation catalytic activity. The plate-like microparticles of K_{0.80}(Li_{0.27}Ti_{1.73})O₄ showed excellent comfort and gloss as well as UV-shielding ability. Coating CeO₂ nanoparticles on plate-like microparticles of K_{0.80}(Li_{0.27}Ti_{1.73})O₄ was useful to improve the comfort without loss of the UV-shielding ability. The plate-like microparticles of CeO₂ and Al₂O₃ also showed nice comfort as well as UV-shielding ability and gloss, respectively. The rod-like and star-like ZnO particles showed excellent soft focus property as well as excellent UV-shielding ability.

These morphology controlled oxide particles may have high potentials for the application to multifunctional cosmetics, such as UV-shielding, comfort, glossing, soft-focusing, etc.